Math 171 - Quiz 7

October 14, 2010

Name key

Score

Show all work to receive full credit. Supply explanations when necessary.

1. (3.3 points) Find the critical numbers of $f(x) = \dfrac{x^2}{(x-1)}$.

CRITICAL #'S ARE DOMAIN INTERIOR POINTS WHERE $f'(x) = 0$ OR $f'(x)$ DNE.

$$f'(x) = \frac{2x(x-1) - x^2}{(x-1)^2} = \frac{x^2 - 2x}{(x-1)^2} = \frac{x(x-2)}{(x-1)^2}$$

$f'(x) = 0 \Rightarrow x(x-2) = 0 \Rightarrow x = 0$ OR $x = 2$

$f'(x)$ DNE $\Rightarrow$ $x = 1$, BUT $x = 1$ IS NOT IN THE DOMAIN OF f

CRITICAL #'S ARE $x = 0$ & $x = 2$.

2. (4.4 points) Find the absolute extreme values of $g(x) = x^3 - 3x^2 + 3x - 1$ on $[-4, 3]$.

$$g'(x) = 3x^2 - 6x + 3 = 3(x^2 - 2x + 1) = 3(x-1)^2$$

$g'(x) = 0 \Rightarrow x = 1$

$g'(x)$ DNE NEVER

CRIT # IS $x = 1$

ENDPOINTS ARE $x = -4$, $x = 3$

$\boxed{g(-4) = -125 \leftarrow \text{ABS MIN}}$

$g(1) = 0$

$\boxed{g(3) = 8 \leftarrow \text{ABS MAX}}$

3. (2.3 points) Find the number c that satisifes the conclusion of Rolle's theorem for the function $f(x) = -x^3 + x$ on the interval $[0, 1]$.

ROLLE'S THEOREM APPLIES SINCE f IS CONTINUOUS AND DIFFERENTIABLE EVERYWHERE, AND $f(0) = f(1) = 0$.

WE LOOK FOR c IN $(0, 1)$ SUCH THAT $f'(c) = 0$.

$$f'(x) = -3x^2 + 1 = 0$$

$$\Rightarrow x^2 = \frac{1}{3} \Rightarrow x = \pm\frac{1}{\sqrt{3}} \Rightarrow \boxed{c = +\frac{1}{\sqrt{3}}}$$